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Observations of Phenomena of Jupiter's Satellites at Windsor, New South Wales, in the year 1888. By John Tebbutt.

Day of Obs. 1888.	Satellite.	Phenomenon.	Phase.	Aperture of Telescope.	Mag. Power.	Greenwich Mean Time of Observation. h m s	Mean Time of Nautical Almanac. h m s
Mar. 27	I.	Ecl. D.	Began to fade	4½-inch	90	23 36 40	23 37 21
27	I.	"	Last seen	"	"	23 37 58	
April 2	I.	"	Began to fade	8-inch	95	7 2 16	7 2 30
2	I.	"	Last seen	"	"	7 3 26	
9	II.	Tr. Egr.	Ext. contact	"	130	0 47 7	0 46
14	III.	Ecl. D.	Began to fade	"	"	23 30 19	23 33 22
14	III.	"	Last seen	"	"	23 39 18	
15	III.	Ecl. R.	First seen	"	"	1 5 50	1 9 58
15	III.	"	Full brightness	"	"	1 17 21	
19	I.	Ecl. D.	Began to fade	"	140	23 44 13	23 46 27
19	I.	"	Last seen	"	"	23 47 23	
22	III.	"	Began to fade	"	"	3 22 17	3 31 1
22	III.	"	Last seen	"	"	3 36 14	
22	III.	Ecl. R.	First seen	"	"	5 5 5	5 8 20
22	III.	"	Full brightness	"	"	5 17 8	
24	II.	Occ. R.	First seen	"	"	23 28 43	23 30
24	II.	"	Bisection	"	"	23 30 39	
24	II.	"	Last contact	"	"	23 32 14	

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Day of Obs. 1888.	Satellite.	Phenomenon.	Phase.	Aperture of Telescope.	Mag. Power.	Greenwich Mean Time of Observation. h m s	Mean Time of Nautical Almanac. h m s
April 27	I.	Tr. Ingr.	Ext. contact	8-inch	170	23 17 7	
27	I.	,,	Bisection	,,	,,	23 19 2	23 19
27	I.	,,	Int. contact	,,	,,	23 21 46	
28	I.	Occ. R.	First seen	,,	,,	22 48 10	
28	I.	,,	Bisection	,,	,,	22 48 58	22 50
28	I.	,,	Last contact	,,	,,	22 50 7	
May 1	II.	Ecl. D.	Last seen	,,	140	22 25 33	22 25 51
5	I.	,,	Began to fade	,,	,,	22 1 9	22 2 18
5	I.	,,	Last seen	,,	,,	22 3 3	
6	I.	Tr. Egr.	Ext. contact	,,	,,	21 41 47	21 41
13	I.	Tr. Ingr.	Int. contact	,,	,,	21 17 42	21 14
13	I.	Tr. Egr.	Int. contact	,,	110	23 20 47	
13	I.	,,	Bisection	,,	,,	23 22 36	23 25
13	I.	,,	Ext. contact	,,	,,	23 24 46	
17	II.	Tr. Ingr.	Ext. contact	,,	170	22 50 41	
17	II.	,,	Bisection	,,	,,	22 52 46	22 53
17	II.	,,	Int. contact	,,	,,	22 55 35	
18	II.	Tr. Egr.	Int. contact	,,	,,	1 14 7	
18	II.	,,	Bisection	,,	,,	1 16 7	1 19
18	II.	,,	Ext. contact	,,	,,	1 18 51	

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Day of Obs. 1888.	Satellite.	Phenomenon.	Phase.	Aperture of Telescope.	Mag. Power.	Greenwich Mean Time of Observation.	Mean Time of Nautical Almanac.
						h m s	h m s
May 20	I.	Ecl. D.	Last seen	8-inch	130	1 50 45	1 50 9
20	III.	Occ. R.	Last contact	,,	95	21 7 36	21 3
20	I.	Tr. Ingr.	Ext. contact	,,	170	22 55 43	22 58
20	I.	,,	Bisection	,,	,,	22 57 43	
20	I.	,,	Int. contact	,,	,,	22 59 57	
21	I.	Occ. D.	First contact	4½-inch	120	20 15 54	20 17
21	I.	,,	Bisection	,,	,,	20 17 39	
21	I.	,,	Last seen	,,	,,	20 19 3	
21	I.	Occ. R.	Bisection	8-inch	170	22 26 49	22 28
21	I.	,,	Last contact	,,	,,	22 27 57	
June 9	II.	Occ. D.	First contact	,,	130	23 41 18	23 45
9	II.	,,	Bisection	,,	,,	23 43 38	
9	II.	,,	Last seen	,,	,,	23 46 12	
12	I.	Tr. Ingr.	Ext. contact	,,	,,	22 35 54	22 37
12	I.	,,	Bisection	,,	,,	22 37 38	
12	I.	,,	Int. contact	,,	,,	22 40 3	
13	I.	Occ. D.	First contact	,,	,,	19 54 10	19 55
13	I.	,,	Bisection	,,	,,	19 55 49	
13	I.	,,	Last seen	,,	,,	19 57 39	

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Day of Obs. 1888.	Satellite.	Phenomenon.	Phase.	Aperture of Telescope.	Mag. Power.	Greenwich Mean Time of Observation. h m s	Mean Time of Nautical Almanac. h m s
June 13	I.	Ecl. R.	First seen	8-inch	130	22 37 33	22 37 39
13	I.	,,	Full brightness	,,	,,	22 39 42	
14	III.	Tr. Egr.	Bisection	,,	,,	20 20 19	20 30
14	III.	,,	Ext. contact	,,	,,	20 31 42	
18	II.	Tr. Ingr.	Ext. contact	,,	,,	20 55 31	20 58
18	II.	,,	Bisection	,,	,,	20 58 51	
18	II.	,,	Int. contact	,,	,,	21 2 30	
18	II.	Tr. Egr.	Int. contact	,,	,,	23 22 7	23 26
18	II.	,,	Bisection	,,	,,	23 25 36	
18	II.	,,	Ext. contact	,,	,,	23 30 40	
21	I.	,,	Int. contact	,,	,,	20 56 31	21 2
21	I.	,,	Bisection	,,	,,	20 58 56	
21	I.	,,	Ext. contact	,,	,,	21 2 5	
21	III.	Tr. Ingr.	Ext. contact	,,	,,	21 59 16	22 10
21	III.	,,	Bisection	,,	,,	22 8 14	
21	III.	,,	Int. contact	,,	,,	22 17 43	
21	III.	Tr. Egr.	Int. contact	,,	,,	23 38 49	23 55
21	III.	,,	Bisection	,,	,,	23 45 58	
21	III.	,,	Ext. contact	,,	,,	23 54 47	

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Day of Obs. 1888.	Satellite.	Phenomenon.	Phase.	Aperture of Telescope.	Mag. Power.	Greenwich Mean Time of Observation. h m s	Mean Time of Nautical Almanac. h m s
June 22	I.	Ecl. R.	First seen	8-inch	75	19 0 57	19 0 41
22	I.	,,	Full brightness	,,	,,	19 2 45	
25	II.	Tr. Ingr.	Ext. contact	,,	170	23 16 1	23 15
25	II.	,,	Bisection	,,	,,	23 18 6	
25	II.	,,	Int. contact	,,	,,	23 20 21	
27	I.	Occ. D.	First contact	,,	—	23 25 25	23 27
27	I.	,,	Bisection	,,	—	23 28 29	
27	I.	,,	Last seen	,,	—	23 30 9	
2	III.	Ecl. D.	Began to fade	,,	75	19 6 53	19 12 5
2	III.	,,	Last seen	,,	,,	19 16 42	
2	III.	Ecl. R.	First seen	,,	,,	20 53 24	20 58 2
4	II.	Occ. D.	First contact	,,	170	19 50 14	19 53
4	II.	,,	Bisection	,,	,,	19 52 23	
4	II.	,,	Last seen	,,	,,	19 54 33	
July 5	II.	Ecl. R.	First seen	,,	130	0 16 14	0 15 34
5	II.	,,	Full brightness	,,	,,	0 20 39	
5	I.	Tr. Ingr.	Ext. contact	,,	170	22 23 22	22 24
5	I.	,,	Bisection	,,	,,	22 25 17	
5	I.	,,	Int. contact	,,	,,	22 27 27	

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Day of Obs. 1888.	Satellite.	Phenomenon.	Phase.	Aperture of Telescope.	Mag. Power.	Greenwich Mean Time of Observation. h m s	Mean Time of Nautical Almanac. h m s
July 7	I.	Tr. Egr.	Int. contact	8-inch	95	19 0 49	19 4
7	I.	,,	Bisection	,,	,,	19 3 14	
7	I.	,,	Ext. contact	,,	,,	19 6 8	
9	III.	Ecl. D.	Began to fade	,,	,,	23 3 29	23 10 53
9	III.	,,	Last seen	,,	,,	23 15 12	
10	III.	Ecl. R.	First seen	,,	,,	0 53 24	0 57 49
10	III.	,,	Full brightness	,,	,,	1 2 9	
11	II.	Occ. D.	First contact	,,	130	22 11 50	22 17
11	II.	,,	Bisection	,,	,,	22 15 34	
11	II.	,,	Last seen	,,	,,	22 18 49	
13	II.	Tr. Egr.	Int. contact	,,	,,	19 34 15	19 37
13	II.	,,	Bisection	,,	,,	19 38 0	
13	II.	,,	Ext. contact	,,	,,	19 41 54	
13	I.	Occ. D.	First contact	,,	,,	21 28 21	21 30
13	I.	,,	Bisection	,,	,,	21 30 51	
13	I.	,,	Last seen	,,	,,	21 32 30	
15	I.	Ecl. R.	First seen	,,	75	19 13 9	19 12 59
15	I,	,,	Full brightness	,,	,,	19 14 47	

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Day of Obs. 1888.	Satellite.	Phenomenon.	Phase.	Aperture of Telescope.	Mag. Power.	Greenwich Mean Time of Observation. h m s	Mean Time of Nautical Almanac. h m s
July 20	II.	Tr. Ingr.	Ext. contact	8-inch	130	19 35 8	
20	II.	,,	Bisection	,,	,,	19 36 58	19 31
20	II.	,,	Int. contact	,,	,,	19 40 8	
20	II.	Tr. Egr.	Int. contact	,,	,,	22 2 9	
20	II.	,,	Bisection	,,	,,	22 4 58	22 2
20	II.	,,	Ext. contact	,,	,,	22 8 23	
20	I.	Occ. D.	First contact	,,	,,	23 17 56	
20	I.	,,	Bisection	,,	,,	23 20 41	23 20
20	I.	,,	Last seen	,,	,,	23 22 45	
21	I.	Tr. Ingr.	Ext. contact	,,	,,	20 29 2	
21	I.	,,	Bisection	,,	,,	20 31 32	20 31
21	I.	,,	Int. contact	,,	,	20 34 41	
21	I.	Tr. Egr.	Int. contact	,,	,,	22 38 46	
21	I.	,,	Bisection	,,	,,	22 42 5	22 44
21	I.	,,	Ext. contact	,,	,,	22 45 19	
22	I.	Ecl. R.	First seen	,,	,,	21 7 24	
22	I.	,,	Full brightness	,,	,,	21 11 18	21 7 40

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Day of Obs. 1888.	Satellite.	Phenomenon.	Phase.	Aperture of Telescope.	Mag. Power.	Greenwich Mean Time of Observation. h m s	Mean Time of Nautical Almanac. h m s
Aug. 5	I.	Occ. D.	First contact	8-inch	130	21 29 17	21 31
5	I.	,,	Bisection	,,	,,	21 32 41	
5	I.	,,	Last seen	,,	,,	21 34 46	
5	II.	Occ. R.	First seen	,,	,,	21 32 11	21 33
5	II.	,,	Bisection	,,	,,	21 33 21	
5	II.	,,	Last contact	,,	,,	21 34 11	
5	II.	Ecl. D.	Last seen	,,	,,	21 37 50	21 39 10
6	II.	Ecl. R.	First seen	,,	,,	0 5 46	0 5 2
6	II.	,,	Full brightness	,,	,,	0 7 25	
6	I.	,,	First seen	,,	,,	0 56 55	0 57 9
6	I.	,,	Full brightness	,,	,,	0 59 51	
6	I.	Tr. Egr.	Int. contact	,,	,,	20 52 32	20 57
6	I.	,,	Bisection	,,	,,	20 54 47	
6	I.	,,	Ext. contact	,,	,,	20 57 26	
12	I.	Occ. D.	First contact	,,	140	23 23 12	23 24
12	I.	,,	Bisection	,,	,,	23 25 16	
12	I.	,,	Last seen	,,	,,	23 26 51	

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Day of Obs. 1888.	Satellite.	Phenomenon.	Phase.	Aperture of Telescope.	Mag. Power.	Greenwich Mean Time of Observation. h m s	Mean Time of Nautical Almanac. h m s
Aug. 13	II.	Occ. R.	First seen	8-inch	140	0 7 34	0 8
13	II.	,,	Last contact	,,	,,	0 9 29	
13	II.	Ecl. D.	Last seen	,,	,,	0 15 22	0 16 51
13	I.	Tr. Egr.	Int. contact	,,	,,	22 48 26	22 52
13	I.	,,	Bisection	,,	,,	22 49 41	
13	I.	,,	Ext. contact	,,	,,	22 51 36	
20	II.	Occ. D.	First contact	,,	,,	0 9 15	0 12
20	II.	,,	Bisection	,,	,,	0 11 44	
20	II.	,,	Last seen	,,	,,	0 13 14	
21	II.	Tr. Egr.	Int. contact	,,	,,	21 20 50	21 21
21	II.	,,	Bisection	,,	,,	21 24 10	
21	II.	,,	Ext. contact	,,	,,	21 27 39	
21	III.	Ecl. D.	Began to fade	,,	,,	22 57 54	23 3 47
21	III.	,,	Last seen	,,	,,	23 7 15	
21	I.	Ecl. R.	First seen	,,	,,	23 15 11	23 15 24
21	I.	,,	Full brightness	,,	,,	23 17 51	

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Day of Obs. 1888.	Satellite.	Phenomenon.	Phase.	Aperture of Telescope.	Mag. Power.	Greenwich Mean Time of Observation. h m s	Mean Time of Nautical Almanac. h m s
Aug. 22	III.	Ecl. R.	First seen	4½-inch	120	0 54 20	0 56 56
22	III.	,,	Full brightness	,,	,,	1 4 18	
Sept. 15	III.	Tr. Egr.	Bisection	8-inch	140	22 6 26	22 13
15	III.	,,	Ext. contact	,,	,,	22 11 50	
26	III.	Ecl. R.	First seen	,,	,,	20 54 59	20 57 32
26	III.	,,	Full brightness	,,	,,	21 5 33	
28	I.	Tr. Ingr.	Ext. contact	,,	230	21 19 37	21 21
28	I.	,,	Bisection	,,	,,	21 21 21	
28	I.	,,	Int. contact	,,	,,	21 22 56	
29	II.	,,	Ext. contact	,,	,,	21 30 52	21 29
29	II.	,,	Bisection	,,	,,	21 33 37	
29	II.	,,	Int. contact	,,	,,	21 35 37	
29	I.	Ecl. R.	First seen	,,	,,	21 46 39	21 46 39
29	I.	,,	Full brightness	,,	,,	21 49 29	
Oct. 1	II.	,,	First seen	,,	140	21 7 27	21 6 39
1	II.	,,	Full brightness	,,	,,	21 10 31	

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Remarks.

1888, March 27.—Sky cloudless, but with full Moon; objects low and unsteady.

April 2.—Clear. Images steady and well defined.

April 9.—Clear; fair definition.

April 14, 15.—Cloudless. Bad definition at the disappearance, but good at reappearance.

April 19.—Clear; definition satisfactory.

April 22.—Clear. Images remarkably steady and well defined. Satellites dwindled to a mere point and then vanished. Time of full brightness perhaps too early.

April 24, 27.—Images steady and well defined.

April 28.—Images steady and pretty well defined; when first seen the projection of the satellite from the limb was rather conspicuous.

May 1.—Definition pretty good, but sky slightly hazy.

May 5, 6.—Sky clear, but planet boiling. Noted time of external contact probably rather early.

May 13.—Planet low and badly defined at ingress, but steady and well defined at egress.

May 17, 18.—Images steady and well defined.

May 20.—Sky clear. Satellite I., which was steady and well defined, did not at the eclipse come quite into contact with the limb, but as it disappeared it assumed an elongated form, the major axis of the oval lying parallel to the limb. Planet low at the occultation and boiling considerably. Images steady and well defined at the transit.

May 21.—Planet boiling at the disappearance; images steady and well defined at the reappearance.

June 9.—Images steady and definition pretty good.

June 12.—Poor definition.

June 13.—Clear. Images pretty steady and well defined.

June 14.—Clouds troublesome and definition bad.

June 18.—Definition fair at ingress, but very bad at egress.

June 21.—Definition satisfactory at all the phases, except at bisection of III. at egress.

June 22.—Clear sky and good definition, but twilight strong, the Sun's upper limb having disappeared below the horizon 14 minutes previously.

June 25, 27.—Very good definition.

July 2.—Clear, but twilight very strong at disappearance; good definition at reappearance.

July 4, 5.—Clear, with good definition. Satellite at eclipse suspected 12·5 seconds earlier.

July 7.—Strong twilight: images tremulous and badly defined.

July 9, 10.—Clear. Images steady and well defined. Satellite again glimpsed 17 seconds after recorded as last seen.

July 11.—Images steady and well defined.

July 13.—Definition fair, but images tremulous.

July 15.—Clear, with good definition, but twilight very strong.

July 20, 21.—Fair definition.

July 22.—Clear, with good definition, but moon very bright.

Aug. 5.—Definition good, but bisections rather late. Eclipse observation unsatisfactory owing to a filmy cloud.

Aug. 6.—Clear. Images well defined.

Aug. 12, 13.—Poor definition at occultation of satellite I. Observation of the reappearance of II. from occultation difficult in consequence of the faintness of the satellite, which was probably involved to some extent in the planet's penumbra. Fair definition at egress of satellite I.

Aug. 20.—Bad definition.

Aug. 21, 22.—Clear, and definition pretty good except at the reappearance

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of satellite III. Satellites I. and III. suspected 14 and 3 seconds earlier than the respective recorded times. Full Moon.

Sept. 15, 26.—Images steady and well defined.

Sept. 28.—Bad definition.

Sept. 29.—Clear, with bad definition.

Oct. 1.—Definition pretty good, but sky slightly hazy. Full brightness very unsatisfactory.

It may be added that no occulting-bar has ever been employed in the eclipse observations made at this observatory from 1866 to the present time, and that the times given in the first and seventh columns of the accompanying table are the Windsor mean times of observation diminished by $10^h\ 3^m\ 20^s{\cdot}8$, and entered to the nearest second.

Windsor, N. S. Wales:
1889, *January* 8.

Request to Observers of Occultations. By John Tatlock, Jun.

(*Communicated by the Secretaries.*)

I should be obliged if those astronomers who secured observations of the occultation of *α Tauri* by the Moon, between the dates of 1884, September 10, and 1888, March 18, inclusive, will kindly send me copies of the records of such observations, together with full particulars essential to their reduction.

Care of North River Safe Deposit Company,
187 *Greenwich Street, New York.*

Report of the Work of the Melbourne Observatory during 1888.

By R. L. J. Ellery, F.R.S.

During the year ending January 1, 1889, the meridian work with the transit-circle has been continued without interruption, and has included, besides the usual observations of the fundamental clock stars and close circumpolar stars, stars of the *Berliner Jahrbuch* which culminate sufficiently high to be well seen at Melbourne, stars to which the places of comets and small planets have been referred, and a list of stars selected by Dr. Gill for the reduction of his heliometer observations, as well as observations of *Iris* at opposition and a list of comparison stars; also to assist Dr. Gill. The number of R.A. observations was 3,154, and those for polar distance 1,571.

Very little work has been done during the year with the great reflector, on account of increasing tarnish of the mirrors, only 170 revisions of Herschel's nebulæ having been secured. Sixteen new nebulæ were catalogued, and three of Herschel's could not be found.